

Remarks

Claims 1-63 are pending in the application. Certain claims have been amended herein. Reconsideration is respectfully requested.

Rejection of Claims

Claims 1, 6 and 8 were rejected by the Examiner as allegedly being obvious in view of Watanabe et al., U.S. Patent Number 4,436,428. Applicants traverse this rejection.

Each of these claims recite an acoustic detector for detecting an acoustic signal. As discussed in depth in the accompanying § 132 Declaration of Stephen Edward Bialkowski, a leading expert in the field of photoacoustic spectroscopy, Watanabe neither teaches nor suggests the presently claimed invention. The invention disclosed and claimed in the present application detects an acoustic signal. Despite the "photoacoustic spectroscopy" language used in the Watanabe reference, Watanabe does not teach or suggest a device that detects an "acoustic signal" as it is known to those of ordinary skill in the art.

Applicants' filed Declaration points out the fact that Watanabe – the only reference recited to reject certain claims of the application – does not disclose a detector or device that detects acoustic signals. In both Applicants' and Watanabe's devices, a release of energy by the molecules absorbing light cause a rise in temperature which in turn causes an increase in pressure. However, that is where the similarity in the devices end. The increase in pressure causes two phenomena. One is the longitudinal pressure wave per se (i.e., an acoustic signal) and the other is mass flow (i.e., an anemometer signal). Applicants' device measures the first listed physical phenomenon and the Watanabe measures the second listed physical phenomenon.

Applicant's claimed device measures the acoustic signals, the longitudinal pressure waves, (pressure = force/unit area). These acoustic signals move at acoustic velocities. The Watanabe apparatus does not measure an acoustic signal (i.e., an acoustic wave) but rather measures mass flow - the flow of a gas caused by the acoustic pressure wave (not the acoustic wave itself but a different physical parameter or phenomenon, the one caused by the acoustic wave, not the acoustic wave itself). Watanabe measures that gas flow with an anemometer (flow = volume/unit time). The gas flow measured by Watanabe moves at significantly slower velocities than do acoustic signals, i.e., not at acoustic velocities. The Examiner's statement

(Dec. 15, 2003, Office action, para. 3) that Watanabe detects an acoustic signal, is incorrect – this has been verified by an expert in the field of photoacoustic spectroscopy in the Declaration filed herewith.

Neither the fact that Watanabe or another patent may have misused the term "acoustic signal," nor the fact that the Examiner has a misunderstanding of the proper definition of an acoustic signal, is controlling for interpreting the present claims. The present claims must be judged in light of correct understandings of the recited terminology by those of ordinary skill in the art. The Declaration filed herewith clearly outlines what those of ordinary skill in the art know the meaning of "acoustic signal" to be and define as such. The Watanabe reference clearly does not teach or suggest a detector that detects acoustic signals. (See, e.g., *In re Hoeksema*, 158 USPQ 596 (CCPA, 1968)).

Moreover, Watanabe teaches away from detecting an acoustic signal – indicating the "noise" received by a microphone (i.e., acoustic signals) is not an acceptable form of detection for his device. Specifically, Watanabe explicitly states that acoustic signals are not detected in its method. See, for example, col. 4, line 66 through col. 5, line 5, where Watanabe states:

"An important difference between the present invention and photoacoustic spectrometers of the prior art is the method and apparatus by means of which the oscillatory flow of fluid (gas) between reference and sample chambers 24 and 22 is detected. *Instead of using a microphone (which is sensitive to ambient noise)* a plurality of hot-wire anemometers is used to form a flowmeter element, 28."

Emphasis added. Watanabe further states that "[a]mbient noise has no effect on this flow detector." Col. 5, lines, 41-42. Thus, Watanabe in fact teaches away from the presently claimed invention.

Accordingly, claims 1, 6, and 8 are allowable over the art of record.

Claim 30 was rejected by the Examiner as allegedly being anticipated by Watanabe et al., U.S. Patent Number 4,436,428. Applicants traverse this rejection.

As discussed above, the Watanabe reference neither teaches nor suggests a device including an acoustic detector for detecting acoustic waves. Accordingly, claim 30 is allowable over the art of record.

Claims 31-37 were rejected by the Examiner as allegedly being obvious in view of Watanabe et al., U.S. Patent Number 4,436,428. Applicants traverse this rejection.

As discussed above, the Watanabe reference neither teaches nor suggests a device including an acoustic detector for detecting acoustic waves. Furthermore, the Watanabe reference neither teaches nor suggests (nor does the Examiner cite any reference that teaches or suggests) the following claimed features:

claim 31's recited acoustic detector sized and shaped to fit about an outside wall of a sample cell;

claim 32's recited support assembly comprising a slotted flexible support bounding and supporting the acoustic detector;

claim 33's recited multiple sample cells including tapered walls;

claim 34's recited tensioning support;

claim 35's recited clamp; or

claim 36's recited cylindrical transducer sized to fit about an outside wall of a sample cell.

Conclusory allegations that any or all such features are known in the art, are insufficient to support a *prima facie* case of obviousness. Claims 31-37 are allowable over the art of record.

Claim 43 was rejected by the Examiner as allegedly being anticipated by Watanabe et al., U.S. Patent Number 4,436,428. Applicants traverse this rejection.

As discussed above, the Watanabe reference neither teaches nor suggests a device including an acoustic detector for detecting acoustic waves. Furthermore, the Examiner's statement that Watanabe teaches a transducer is also incorrect. The devices 76, 78 are flow meter grid assemblies that operate like the Watanabe thermal flow meter 28 (see col. 5, ll. 6064, col. 6, ll. 17-20). Accordingly, claim 43 is allowable over the art of record.

Claims 43-46 were rejected by the Examiner as allegedly being obvious in view of Watanabe et al., U.S. Patent Number 4,436,428. Applicants traverse this rejection.

As discussed above, the Watanabe reference neither teaches nor suggests a device including an acoustic detector for detecting acoustic signals. Furthermore, the Watanabe reference neither teaches nor suggests (nor does the Examiner cite any reference that teaches or suggests) the following claimed features:

claim 43's recited transducer;

claim 44's recited transducers positioned beneath the sample cell;
claim 45's recited transducers connected to a base plate (or a base plate); or
claim 46's recited integrated circuitry connectable to each transducer.

Conclusory allegations that any or all such features are known in the art are insufficient to support a *prima facie* case of obviousness. Claims 43-46 are allowable over the art of record.

Claims 51, 54-61 and 63 were rejected by the Examiner as allegedly being obvious in view of Watanabe et al., U.S. Patent Number 4,436,428. Applicants traverse this rejection.

As discussed above, the Watanabe reference neither teaches nor suggests a device including an acoustic detector for detecting acoustic signals. Furthermore, Watanabe neither teaches nor suggests (nor does the Examiner cite any reference that teaches or suggests) any of the following claimed features:

claim 51's recited body having at least three sample cells for holding samples for PAS analysis, the sample cells having an open upper end; nor a sealing plate positioned to cover the upper portions of the sample cells such that the sample cells are substantially sealed from an outside environment;

claim 54's recited method for PAS analysis including providing a sample array vessel having a matrix of at least three sample cells, the sample cells retaining solutions therein;

claim 55's recited method wherein at least one transducer is used to detect acoustic signals generated by the analytes;

claim 56's recited method wherein acoustic signals generated by analytes in the solutions are detected using at least one contact transducer;

claim 57's recited method wherein acoustic signals generated by analytes in the solutions are detected using at least one air-coupled transducer;

claim 58's recited method wherein acoustic signals generated by analytes in the solutions are detected using at least one immersion transducer (the Watanabe detector couldn't be immersed);

claim 59's recited method wherein a sample array vessel is calibrated by use of a standard solution;

claim 60's method wherein a sample array vessel is calibrated by use of the at least one transducer in a pulse-echo mode;

claim 61's recited method wherein a sample array vessel is calibrated by tapping the sample array vessel with a reproducible force to generate an acoustic wave and then detecting the acoustic wave; or

claim 63's recited method including providing a sample array vessel having at least three sample cells for retaining solutions having analytes therein; simultaneously exposing the solutions in the at least three sample cells to a light source to cause analytes in the solutions to emit acoustic signals; placing at least one acoustic detector adjacent the sample array vessel; and simultaneously detecting acoustic signals emitted by analytes in the solutions in the at least three sample cells.

Conclusory allegations that any or all such features are known in the art are insufficient to support a *prima facie* case of obviousness. Claims 51, 54-61 and 63 are allowable over the art of record.

Allowed Claims

Applicants note, with thanks, the allowance of claims 9-29, 38-42, 47-50, 52-53, and 62 and the mere objection to claims 2-5 and 7.

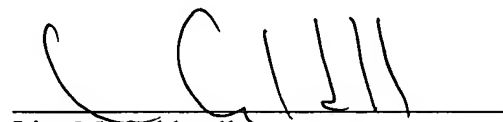
With respect, Applicant's also note that Watanabe could not employ the recited "acoustic fins" because Watanabe does not detect acoustic signals.

For at least the reasons set forth above, the claims are allowable over the art of record and notification to that effect is respectfully requested.

Respectfully submitted,

KLARQUIST SPARKMAN, LLP

By



Lisa M. Caldwell
Registration No. 41,653

One World Trade Center, Suite 1600
121 S.W. Salmon Street
Portland, Oregon 97204
Telephone: (503) 226-7391
Facsimile: (503) 228-9446

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

James E. Amonette et al.

Application No. 10/002,602

Filed: November 13, 2001

Confirmation No. 2928

For: PHOTOACOUSTIC SPECTROSCOPY
SAMPLE ARRAY VESSELS AND
PHOTOACOUSTIC SPECTROSCOPY
METHODS FOR USING THE SAME

Examiner: Richard A. Rosenberger

Art Unit: 2877

Attorney Reference No. 23-59244

CERTIFICATE OF MAILING

I hereby certify that this paper and the documents referred to as being attached or enclosed herewith are being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450 on the date shown below.

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for Applicant(s)

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DECLARATION OF STEPHEN EDWARD BIALKOWSKI

I, Dr. Stephen Edward Bialkowski, hereby declare as follows:

1. I received a Bachelor of Science degree in Professional Chemistry from Eastern Michigan University in 1975 and a Doctor of Philosophy degree in Chemistry from the University of Utah in 1978.
2. From 1978-1980, I was appointed a NRC Postdoctoral Fellow at the National Bureau of Standards and was a visiting scientist at the University of Utah in 1980. From 1980-1983, I was an Assistant Professor of Chemistry at Michigan Technology University. From 1983-1993, I was an Assistant and an Associate Professor of Chemistry at Utah State University. From 1993 to the present I have served as a Professor of Chemistry at Utah State University.
3. I am a member of the following organizations: American Association for the Advancement of Science; American Chemical Society; American Geophysical Union; International Chemometrics Society (Founding Member); Optical Society of America; Society for Applied Spectroscopy; Utah Academy of Sciences, Arts, and Letters.

4. I am an expert in, *inter alia*, photothermal spectroscopy, including photoacoustic spectroscopy, as evidenced by at least the following:

- (a) the numerous articles on the subject of spectroscopy I have authored (see Exhibit A – List of Publications);
- (b) the leading photothermal spectroscopy technical reference entitled Photothermal Spectroscopy Methods for Chemical Analysis, which I authored (see Exhibit B – web site page describing the reference);
- (c) the numerous Photothermal Spectroscopy Symposia and Meetings which I organized and in which I have participated (see Exhibit C – List of Symposia, Meetings, Panels, Chairmanships, and Professional Affiliations);
- (d) the numerous Spectroscopy Panels and Chairmanships in which I participate (see Exhibit C); and
- (e) the many Technical Journals for which I am a Reviewer, including but not limited to Applied Spectroscopy (see Exhibit C).

5. I am familiar with the invention disclosed and claimed in the above-referenced patent application ("the Application").

6. I am not a co-inventor of the subject matter described and claimed in the Application.

7. I am familiar with the reference currently cited by the Patent and Trademark Office against the Application – Watanabe et al., U.S. Patent Number 4,436,428 ("Watanabe").

8. The invention disclosed and claimed in the Application detects an acoustic signal. Despite the "photoacoustic spectroscopy" language used in the Watanabe reference, Watanabe does not teach or suggest a device that detects an "acoustic signal" as it is known to those of ordinary skill in the art.

More specifically, the Application describes an apparatus that detects acoustic signals (i.e., longitudinal pressure waves) generated by the absorption of light by particular samples. The Application discloses an invention that uses an array to detect multiple samples, either sequentially or simultaneously, by using one or more transducers to detect acoustic signals (longitudinal pressure waves) due to absorption of a pulsed light source by samples. The pulsed light strikes the samples leading to several physical changes. In the Application's disclosed invention the signal detected is the longitudinal pressure wave (i.e., the acoustic signal) launched through the sample, not the expansion of the solid compressing the gas above the sample. The

acoustic signal (longitudinal pressure wave) detected by the piezoelectric detector travels at the speed of sound through the sample and array apparatus. The longitudinal pressure wave (acoustic signal) strikes the detector giving rise to a voltage across the acoustic signal detector. The magnitude of the signal is dependent on the concentration of sample and independent of the frequency of the pulsed light source.

Watanabe describes an apparatus that detects flow of a gas rather than detecting an acoustic signal (a longitudinal pressure wave). More specifically, Watanabe uses a hermetically sealed sample and reference chamber to detect a sample by using an anemometer to detect the flow of a gas arising from the expansion of the sample substrate due to the absorption of a modulated light source. The modulated light strikes the sample leading to several physical changes. In Watanabe the signal detected is the flow of gas above the solid sample past the anemometer due to the periodic expansion of the solid compressing the gas above. The Watanabe apparatus measures the flow of gas due to the expansion of the heated sample. The induced flow of the gas passes the wires of the anemometer at subsonic rates. The magnitude of the fluid flow signal is dependent upon the thermal diffusion properties of the gas and sample, the frequency of the modulated light source absorbed by the sample, in addition to the absorption depth of the sample.

There are several very notable differences between the invention disclosed in the Application and the device described in Watanabe. One important difference is that each detects different types of signals – that is, each relies on the measurement of very different physical phenomena that result from the absorption of light by a sample. In both cases the release of energy by the molecules absorbing light causes a rise in temperature which in turn causes an increase in pressure. However, the increase in pressure causes two phenomena. One is the longitudinal pressure wave per se (i.e., the acoustic signal) and the other is mass flow (i.e., the anemometer signal).

The invention disclosed and claimed in the Application measures acoustic signals, longitudinal pressure waves, (pressure = force/unit area) with a transducer. These acoustic signals move at acoustic velocities. The Watanabe apparatus does not measure an acoustic signal but instead measures the flow of a gas with an anemometer (flow = volume/unit time). The gas flow measured by Watanabe moves at significantly slower velocities, i.e., not at acoustic velocities.

Since the invention disclosed in the Application does not include a hermetically sealed device, an anemometer such as used by Watanabe could not be used in the Application device to detect the acoustic signals. Furthermore, an anemometer could not detect an acoustic signal (which by definition is a longitudinal pressure wave that travels at the velocity of sound) even in a hermetically sealed device. Conversely, the invention disclosed in the Application could not detect the flow of gas that is detected in Watanabe.

9. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true. I further understand that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001, and that such willful false statements may jeopardize the validity of the above-referenced Application or any patent issuing thereon.

Date: 3/16/04


By: 
Name: Dr. Stephen Edward Bialkowski
Title: Professor

Exhibit A - List of Publications

PUBLICATIONS:

1. *The Infrared Multiphoton Photochemistry of Methanol* Stephen E. Bialkowski and William A. Guillory **Journal of Chemical Physics** 67 2061 1977
2. *Interface Between a Biomation 8100 and a Remote Computer for Data Acquisition in TEA-CO₂ Laser Induced Photochemistry* Stephen E. Bialkowski and William A. Guillory **Review of Scientific Instruments** 48 115 1977
3. *Collisionless Formation and Rovibronic Relaxation of CH and OH from the IR Multiphoton Photolysis of CH₃OH* Stephen E. Bialkowski and William A. Guillory **Journal of Chemical Physics** 68 3339 1978
4. *The Infrared Photolysis of SO₂* Stephen E. Bialkowski and William A. Guillory **Chemical Physics Letters** 60 429 1979
5. *Infrared Photolysis of Methanol and Monomethylamine (Dissertation)* University Microfilms Ann Arbor, MI. 1979
6. *Gas Phase Laser Induced Fluorescence Spectroscopy of CFCl* Stephen E. Bialkowski, David S. King, and John C. Stephenson **Journal of Chemical Physics** 71 4010 1979
7. *The Determination of Mass Transport Coefficients and Vibrational Relaxation Rates of Species Formed in Laser Photolysis Experiments* Stephen E. Bialkowski, David S. King, and John C. Stephenson **Journal of Chemical Physics** 72 1156 1980
8. *Energy Partitioning in the IR Multiphoton Dissociation of Molecules: Energy of XCF₂ and XCFCI from CF₂CFCl* John C. Stephenson, Stephen E. Bialkowski, and David S. King **Journal of Chemical Physics** 72 1161 1980
9. *Simple Parallel Interface Between an Optical Multichannel Analyzer and a Microprocessor* Stephen E. Bialkowski **Review of Scientific Instruments** 51 850 1980
10. *A Quantitative Test of Unimolecular Rate Theory in the Multi-Photon Dissociation of CF₂CFCl* John C. Stephenson, Stephen E. Bialkowski, David S. King, Everet Thiele, James Stone and Myron F. Goodman **Journal of Chemical Physics** 74 3905 1981
11. *Selection Rules and Linestrength Factors for Multiphoton Transitions in Gas Phase Molecular Spectroscopy* Stephen E. Bialkowski and William A. Guillory **Chemical Physics** 55 229 1981
12. *Absolute Reaction Rate Constants of CFCI X₁(A₁) Reactions with Nitrogen Oxides* Stephen E. Bialkowski and William A. Guillory **Journal of Physical Chemistry** 86 2007 1982
13. *Vibronic Relaxation Dynamics of the Σ_g^+ State of C₃* Y. Gu, Michael L. Lesiecki, Stephen E. Bialkowski, and William A. Guillory **Chemical Physics Letters** 92 443 1982
14. *On the Determination of Kinetic Rate and Mass Transport Coefficients in Laser Pump-Probe Experiments* Stephen E. Bialkowski **Chemical Physics Letters** 83 341 1981
15. *A Statistical Interpretation of the Rotational Temperature of NO Desorbed for Ru(001)* Stephen E. Bialkowski **Journal of Chemical Physics** 78 600 1983
16. *Chemical Reactions Following the IRMPD of C₂F₃Cl* George R. Long, Linda D. Prentice and Stephen E. Bialkowski **Applied Physics B** 34, 97 1984
17. *The Effect of Mass Diffusion in Gas Phase Thermal Lens Experiments* Stephen E. Bialkowski **Chemical Physics Letters** 104 448 1984
18. *Pulsed Infrared Laser Thermal Lens Spectrophotometric Determination of Trace Level Analytes: Quantitation of Parts Per Billion Dichloro-difluoro-methane* George R. Long and Stephen E. Bialkowski **Analytical Chemistry** 56 2806 1984
19. *Saturation Effects of Gas Phase Photothermal Deflection Spectrometry* George R. Long and Stephen E. Bialkowski **Analytical Chemistry** 57 1079 1985
20. *Pulsed Infrared Laser Thermal Lens Spectrometry of Flowing Gas Samples* Scott L. Nickolaisen and Stephen E. Bialkowski **Analytical Chemistry** 57 758 1985
21. *Photothermal Lens Aberration Effects in Two Laser Thermal Lens Spectrometry* Stephen E. Bialkowski **Applied Optics** 24 2792 1985

22. *Pulsed Laser Thermal Lens Spectrophotometry of Flowing Samples* Scott L. Nickolaisen and Stephen E. Bialkowski **IEEE Technical Digest** CH21741 110 1985
23. *Pulsed Laser Thermal Lens Spectrometry for Flowing Liquid Detection* Scott L. Nickolaisen and Stephen E. Bialkowski **Analytical Chemistry** 58 215 1986
24. *Error Reduction in Pulsed Infrared Laser Photothermal Deflection Spectrometry* George R. Long and Stephen E. Bialkowski **Analytical Chemistry** 58 80 1986
25. *A Least Squares Digital Filter for Repetitive Data Acquisition* Scott L. Nickolaisen and Stephen E. Bialkowski **Journal of Chemical Information and Computer Science** 26 57 1986
26. *Pulsed Laser Thermal Lens Spectrophotometry of Liquid Samples Using an Optical Fiber Beam Guide with Interference Orthogonal Signal Processing* Stephen E. Bialkowski **Analytical Chemistry** 58 1706 1986
27. *Binary Code Decimal to Binary Program Modification of a Popular Digital Delay Module* Stephen E. Bialkowski **Review of Scientific Instruments** 57 1431 1986
28. *Species Selective Detection in Gas Chromatography Through Photothermal Deflection Spectroscopy* Scott L. Nickolaisen and Stephen E. Bialkowski **Journal of Chromatography** 366 127 1986
29. *A Scheme for Species Discrimination and Quantitative Estimation Using Incoherent Linear Optical Signal Processing* Stephen E. Bialkowski **Analytical Chemistry** 58 2561 1986
30. *Pulsed Infrared Laser Photothermal Spectroscopy in Gas Phase Chemical Analysis* Stephen E. Bialkowski **IEEE Technical Digest** 86CH2274-9 72 1986
31. *Pulsed-Laser Photothermal Spectroscopy* Stephen E. Bialkowski **Spectroscopy** 1 26 1986
32. *Optimal Estimation of Impulse-Response Signals Through Digital Innovations and Matched Filter Smoothing* Stephen E. Bialkowski **Review of Scientific Instruments** 58 687 1987
33. *Quantitative Discrimination of Gas Phase Species Based On Single-Wavelength Non-Linear Intensity Dependent Pulsed Infrared Laser Excited Photothermal Deflection Signals* Stephen E. Bialkowski and George R. Long **Analytical Chemistry** 59 873 1987
34. *Simple Scheme for Variable High Power Laser Beam Attenuation* Stephen E. Bialkowski **Review of Scientific Instruments** 58 2338 1987
35. *Pulsed Laser Photothermal Spectroscopy* Stephen E. Bialkowski **Advances in Laser Science, AIP Proceedings** 172 738 1988
36. *Real Time Digital Filters: Finite Impulse-Response Filters* Stephen E. Bialkowski **Analytical Chemistry** 60 355A 1988
37. *Real Time Digital Filters: Infinite Impulse-Response Filters* Stephen E. Bialkowski **Analytical Chemistry** 60 403A 1988
38. *Optical Processing of Time Varying Pulsed Laser Excited Photothermal Spectroscopy Signals with Matched Filter Smoothing* Stephen E. Bialkowski and Salvador Herrera **Analytical Chemistry** 60 1586 1988
39. *Optimized Spectroscopic Signal Estimates Using Integration and Matched Filters* Stephen E. Bialkowski **Applied Spectroscopy** 42 807 1988
40. *Ultrasensitive Photothermal Deflection Spectrometry Using an Analyzer Etalon* Stephen E. Bialkowski and Zhi-Fang He **Analytical Chemistry** 60 2674 1988
41. *Theoretical Accounting for the Acoustic Energy Produced by Pulsed Laser Excitation of Optically Thin Samples* Stephen E. Bialkowski **Chemical Physics Letters** 151 88 1988
42. *Generalized Digital Smoothing Filters Made Easy by Matrix Calculations* Stephen E. Bialkowski **Analytical Chemistry** 61 1308 1989
43. *Data Analysis in the Shot Noise Limit Part I: Single Parameter Estimation with Poisson and Normal Probability Density Functions* Stephen E. Bialkowski **Analytical Chemistry** 61 2479 1989
44. *Data Analysis in the Shot Noise Limit Part II: Methods for Data Regression* Stephen E. Bialkowski **Analytical Chemistry** 61 2483 1989
45. *Application of the BaTiO₃ Beam Fanning Limiter as an Adaptive Spatial Filter for Signal Enhancement in Pulsed Laser Excited Photothermal Spectroscopy* Stephen E. Bialkowski **Optics Letters** 14 1020 1989

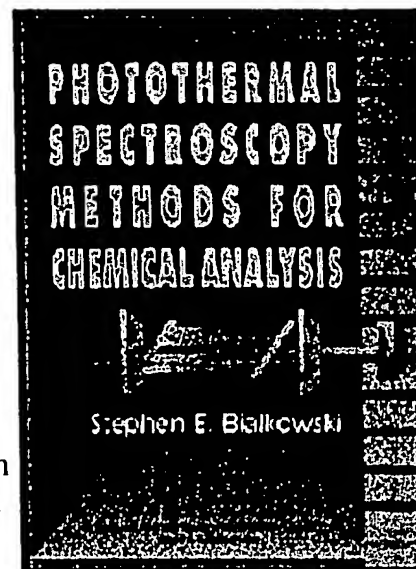
46. *Survey of Properties of Volume Holographic Materials* Richard D. Rallison and Stephen E. Bialkowski in *Practical Holography III SPIE Proceedings* 1051 68 1989
47. *Data Analysis in the Shot Noise Limit Part III: An Adaptive Method for Data Smoothing* Stephen E. Bialkowski *Journal of Chemometrics* 4 271 1990
48. *Exchange of Comments on Data Analysis in the Shot Noise Limit Part I: Single Parameter Estimation with Poisson and Normal Probability Density Functions* Stephen E. Bialkowski *Analytical Chemistry* 62 2141 1990
49. *Expectation-Maximization Algorithm for Regression, Deconvolution, and Smoothing of Shot-Noise-Limit Data* Stephen E. Bialkowski *Journal of Chemometrics* 5 211 1991
50. *Using Optical Novelty Filters in Analytical Spectroscopy* Stephen E. Bialkowski *Proceeding of the Society for Optical and Quantum Electronics* 1991 780 1991
51. *Diffraction Properties of Gelatin as an Aerogel* Richard D. Rallison and Stephen E. Bialkowski *Diffraction Optics: Design, Fabrication, and Applications Technical Digest* (Optical Society of America, Washington, D.C.) 9 111-113 1992
52. *Transition Saturation in Ethylene Observed with Infrared Photothermal Spectrometry* Stephen E. Bialkowski and Zhi-Fang He *Environmental and Process Monitoring Technologies* Tuan Vo-Dinh, Editor *SPIE Proceedings* 1637 134 1992
53. *Comparison of BaTiO₃ Optical Novelty Configuration and Photothermal Lensing Configuration in Photothermal Experiments* Shashi D. Kalaskar and Stephen E. Bialkowski *Analytical Chemistry* 64 1824 1992
54. *Pulsed-Laser Excited Differential Photothermal Deflection Spectrometry* Stephen E. Bialkowski, Xu Gu, Pete E. Poston, and Linda S. Powers *Applied Spectroscopy* 46 1335 1992
55. *Analysis of 1st-Order Rate Constant Spectra With Regularized Least-Squares and Expectation Maximization: 1. Theory and Numerical Characterization* Brett T. Stanley, Stephen E. Bialkowski, and David B. Marshall *Analytical Chemistry* 65 259 1993
56. *A Comparison of Three Multi-Platform Message-Passing Interfaces on an Expectation Maximization Algorithm* Csaba Gyulai, Stephen E. Bialkowski, Gardner S. Stiles, and Linda S. Powers in *Transputer Applications and Systems '93, Vol. 1 Proceedings of the 1993 World Transputer Congress* R. Grebe, J. Hektor, S. C. Hilton, M. R. Jane, and P. H. Welch, Eds. IOS Press, Amsterdam, pp. 451-464 1993
57. *Accounting for Saturation Effects in Pulsed Infrared Laser Excited Photothermal Spectroscopy* Stephen E. Bialkowski *Applied Optics* 32 3177 1993
58. *Optical Bleaching Kinetics of Ethylene Observed with Pulsed Infrared Laser Excited Photothermal Lens Spectrometry* Stephen E. Bialkowski and Z. F. He *Longer Wavelength Lasers and Applications* Gabor Patonay, Ed. *SPIE Proceedings* 2138 140 1994
59. *Obtaining Accurate Measurements of Organic Dye Solutions using Pulsed Laser Photothermal Deflection Spectroscopy* Agnès Chartier and Stephen E. Bialkowski *Analytical Chemistry* 67 2672 1995
60. *Laser Excited Fluorescence of Dityrosine* Sahar F. Mahmoud and Stephen E. Bialkowski *Applied Spectroscopy* 49 1669 1995
61. *Detection of Dityrosine in Apoferritin* Sahar F. Mahmoud and Stephen E. Bialkowski *Applied Spectroscopy* 49 1677 1995
62. *Photothermal Spectroscopy Methods for Chemical Analysis* Stephen E. Bialkowski, Volume 134 in *Chemical Analysis*, Wiley, New York, 1996
63. *Sub-Shot-Noise Light Sources: A Quiet Revolution in Light Control* Stephen E. Bialkowski *Critical Reviews in Analytical Chemistry* 26 101 1996
64. *Diffraction Effects in Single- and Two-Laser Photothermal Lens Spectroscopy* Stephen E. Bialkowski and Agnès Chartier *Applied Optics* 36 6711 1997
65. *Photothermal Lens Spectrometry of Homogeneous Fluids with Incoherent White-Light Excitation Using a Cylindrical Sample Cell* Agnès Chartier and Stephen E. Bialkowski *Optical Engineering* 36 303 1997

66. *Temperature-Dependent Electron Capture Detector Response to Common Alternative Fluorocarbons* Sonia R. Sousa and Stephen E. Bialkowski **Analytical Chemistry** 69 3871 1997
67. *Molecular Interactions at Octadecylated Chromatographic Surfaces* James W. Burns, Stephen E. Bialkowski, and David B. Marshall **Analytical Chemistry** 69 3861 1997
68. *Overcoming the Multiplex-Disadvantage using Maximum-Likelihood Inversion* Stephen E. Bialkowski **Applied Spectroscopy** 52 591 1998
69. *Progress Toward a Better Understanding of Signal Generation Processes in the Laser-Excited Photothermal Spectroscopy of Homogeneous Samples* Stephen E. Bialkowski **Trends in Analytical Chemistry** 17 520-532 1998
70. *Laser-Excited Photothermal Lens Spectrometry in a Low-Volume Cylindrical Sample Cell* Stephen E. Bialkowski **Israel Journal of Chemistry** 38 159-167 1998
71. *Methods for Modeling and Diagnosis of Nonlinear Absorption in Photothermal and Photoacoustic Spectrometry of Homogeneous Fluids* Stephen E. Bialkowski and Agnès Chartier **Photoacoustic and Photothermal Phenomena**, F. Scudieri and M. Bertolotti, Ed., AIP Conference Proceedings 463 46-49 1999
72. *Using Slow Measurement Systems to Measure Fast Excited-State Kinetics with Nonlinear Rate-Competitive Optical Bleaching* Stephen E. Bialkowski and Agnès Chartier **Photoacoustic and Photothermal Phenomena**, F. Scudieri and M. Bertolotti, Ed. AIP Conference Proceedings 463 14-17 1999
73. *Using an Optical Novelty Filter to Enhance Contrast in Photothermal Refraction Spectrometry* Stephen E. Bialkowski **Photoacoustic and Photothermal Phenomena**, F. Scudieri and M. Bertolotti, Ed., AIP Conference Proceedings 463 67-71 1999
74. *Using Sub-Microliter Cylindrical Sample Cells for Photothermal Lens Spectrometry of Stable and Photo-Labile Species* Stephen E. Bialkowski and Agnès Chartier, **Photoacoustic and Photothermal Phenomena**, F. Scudieri and M. Bertolotti, Ed., AIP Conference Proceedings 463 226-228 1999
75. *Fractured Zone Plates for Spatial Separation of Frequencies*, Richard D. Rallison and Stephen E. Bialkowski **Proc. SPIE-Int. Soc. Opt. Eng.** 3633 92-102 2000
76. *Thermal Lens Calorimetry: A Novel Approach to the Study of Thermodynamics* George R. Long and Stephen E. Bialkowski **Chemical Educator** 5, 145-148 2000
77. *Optical Bleaching in Continuous Laser Excited Photothermal Lens Spectrometry* Agnès Chartier and Stephen E. Bialkowski **Applied Spectroscopy** 55, 84-91 2001
78. *Comparison of Detection Limits and Relative Responses for Alternative Fluorocarbons by GC-ECD, GCAED, and GC-MS* Sonia R. Sousa and Stephen E. Bialkowski **Anal. Chim. Acta** 43(2), 181-186 2001
79. *Photothermal Spectrometry in Small Liquid Channels* Agnes B. Chartier and Stephen E. Bialkowski **Anal. Sci. (Japan)** 17, i99-i101 2002
80. *Using an Expectation-Maximization Algorithm to Obtain Dielectric Relaxation Time Spectra of Aqueous Montmorillonite Clay Suspensions* Stephen E. Bialkowski, Lynn Dudley, and Dani Or **Applied Spectroscopy** 56 1470-1474 2002
81. *Low Frequency Impedance Behavior of Montmorillonite Suspensions: Polarization Mechanisms in the Low Frequency Domain* Lynn M. Dudley, Stephen E. Bialkowski, Dani Or, and Chad Junkermeier, **Soil Science Society of America Journal** 67 518-526 2003
82. *Steady-State Absorption Rate Models for Use in Relaxation Rate Studies with Continuous Laser Excited Photothermal Lens Spectrometry* Stephen E. Bialkowski **Photochemical & Photobiological Sciences** 2 779-787 2003



Photothermal Spectroscopy Book

Photothermal Spectroscopy Methods for Chemical Analysis
Volume 134 in *Chemical Analysis: A Series of Monographs on Analytical Chemistry and Its Applications*, J. D. Winefordner, Series Editor 1996 John Wiley & Sons, Inc. (ISBN 0-471-57467-8, 584 pgs) local library (QD96.P54B53). It may be found at amazon.com or barnesandnoble.com



- Click here to view the "on-line" version of Chapter 1
- This book concentrates on the theoretical basis and practical considerations required for successful application of photothermal spectroscopy to analysis of homogeneous samples. It provides a nearly complete description of photothermal spectroscopy using a common mathematical language. This systematic approach to the physical basis of photothermal signal generation results in a more complete understanding of why certain problems are encountered in analytical applications and how these problems may be avoided. Information gathered to produce this description draws from analytical spectroscopy, measurement physics, physical optics, and chemical dynamics.
- Three years in the making, it is much more than a collection of old ideas. New approaches to theoretical treatments of hydrodynamic equations resulting in the thermal diffusion and acoustic propagation modes of relaxation, a Fourier optics based diffraction approach to accurate calculation of photothermal signals derived from heat conduction, and the role of energy transfer kinetics on the photothermal signals, can be found in this text. These treatments result in new models that can guide researchers in planning photothermal experiments.



Exhibit C - List of Symposia, Meetings, Panels, Chairmanships, and Professional Affiliations

SYMPOSIA AND MEETINGS ORGANIZED:

- AAAS Pacific Division Meeting Committee 2002-2004
- FACSS Symposium on Photothermal Spectroscopy 1986
- Physical Sciences Division, Annual Meeting, Utah Academy of Science, Arts, and Letters 1988
- FACSS Symposium on Photothermal Spectroscopy 1989
- Physical Sciences Division, Annual Meeting, Utah Academy of Science, Arts, and Letters 1989
- FACSS Symposium on Photothermal Spectroscopy 1990
- Physical Sciences Division, Annual Meeting, Utah Academy of Science, Arts, and Letters 1990
- Physical Sciences Division, Annual Meeting, Utah Academy of Science, Arts, and Letters 1991
- American Chemical Society 45th Annual Summer Symposium on Analytical Chemistry 1992
- Physical Sciences Division, Annual Meeting, Utah Academy of Science, Arts, and Letters 1998
- Physical Sciences Division, Annual Meeting, Utah Academy of Science, Arts, and Letters 1999
- Physical Sciences Division, Annual Meeting, Utah Academy of Science, Arts, and Letters 2000

REVIEWER FOR:

- Academic Press
- Analytica Chimica Acta
- Analytical Biochemistry
- Analytical Chemistry
- Analytical and Bioanalytical Chemistry
- Applied Optics
- Applied Physics E, Instrumental Science
- Applied Physics Letters
- Applied Spectroscopy
- Chemical Physics
- Chemometrics and Intelligent Laboratory Systems
- CRC Critical Reviews in Analytical Chemistry
- Journal of Biomedical Optics
- Journal of Chemical Physics
- Journal of Chemometrics
- Journal of Physical Chemistry
- Journal of the American Chemical Society
- Journal of the Optical Society of America B
- Measurement Science and Technology
- Optics Letters
- Review of Scientific Instruments
- Spectrochimica Acta
- Talanta
- Trends in Analytical Chemistry (TrAC)
- Environmental Protection Agency
- National Institutes of Health
- National Science Foundation
- Petroleum Research Fund
- Research Corporation
- Research Council of Canada

PANELS, CHAIRMANSHIPS, AND OTHER PROFESSIONAL AFFILIATIONS:

- Editorial Board, CRC Critical Reviews of Analytical Chemistry, 1996—present
- International Advisory Board, International Conference On Photoacoustic And Photothermal Phenomena 2001—present

- Web Edition Editor for Society for Applied Spectroscopy, 2002—present
- Participant in US EPA Public Involvement in EPA Decisions dialogue 2001
- Participant in US EPA Libraries as a Community Resource for Environmental Information dialogue 2000
- Consultant, IUPAC Commission On Molecular Structure and Spectroscopy, Quantities, Terminology and Symbols in Photothermal and Related Spectroscopies 1998—present
- Representative in the American Association for the Advancement of Science section on Societal Impacts of Science and Engineering 1999-2002
- FACSS Delegate, Society for Applied Spectroscopy 2000-2002
- Chairman Physical Sciences Division, Utah Academy of Sciences, Arts, and Letters 1987-1991
- Chairman Elect, Society for Applied Spectroscopy, Intermountain Section 1989-1990
- Chairman, Society for Applied Spectroscopy, Intermountain Section 1990-1991
- Chairman Physical Sciences Division, Utah Academy of Sciences, Arts, and Letters 1998-2001
- Chairman Elect, Society for Applied Spectroscopy, Intermountain Section 1998-1999
- Chairman, Society for Applied Spectroscopy, Intermountain Section 1999-2001